

**NIUF 444-97**

NIUF/IIW/PW-9701

**Guidelines for ISDN Wiring in  
New Residential and New Small Business Construction**

October 1997

## NOTICE OF DISCLAIMER

THIS DOCUMENT IS INTENDED TO PROVIDE INFORMATION CONCERNING, BUT NOT LIMITED TO, GUIDELINES FOR WIRING FOR ISDN. THESE GUIDELINES WERE DEVELOPED AND APPROVED BY ORGANIZATIONS PARTICIPATING IN THE NORTH AMERICAN ISDN USERS' FORUM (NIUF) AS OF OCTOBER 1997. NEITHER THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY NOR ANY OF THE PARTICIPANTS IN THE NIUF MAKE ANY REPRESENTATION OR WARRANTY, EXPRESS OR IMPLIED, WITH RESPECT TO THE SUFFICIENCY, ACCURACY, OR USE OF ANY INFORMATION OR OPINION CONTAINED HEREIN. THE USE OF THIS INFORMATION OR OPINION IS AT THE RISK OF THE USER. UNDER NO CIRCUMSTANCES SHALL NIST, OR ANY PARTICIPANT IN THE NIUF BE LIABLE FOR ANY DAMAGE OR INJURY INCURRED BY ANY PERSON ARISING OUT OF THE SUFFICIENCY, ACCURACY, OR USE OF ANY INFORMATION OR OPINION CONTAINED HEREIN.

NIST does not recommend or endorse products and nothing contained herein is intended as a recommendation or endorsement of any product.

## Table Of Contents

<b>TABLE OF CONTENTS .....</b>	<b>iii</b>
<b>SECTION 1 - INTRODUCTION.....</b>	<b>1</b>
<b>SECTION 2 AN INTRODUCTION TO ISDN SERVICE AND WIRING .....</b>	<b>3</b>
2.1 ISDN COMPONENTS .....	3
2.1.1 Connectors.....	3
2.1.2 Outlets .....	5
2.1.3 Cable .....	7
2.1.4 The Demarcation Point .....	7
2.1.5 The ISDN U interface, S/T interface, and ISDN Terminal Equipment .....	7
2.2 GUIDELINES FOR INSTALLING ISDN IN A NEW RESIDENCE OR NEW SMALL BUSINESS.....	8
2.2.1 Requirements .....	8
2.2.2 STAR CONFIGURATION.....	9
2.2.3 TASK - LOCATION OF THE DISTRIBUTION DEVICE .....	10
2.2.4 TASK - WIRE THE SERVICE OUTLETS.....	12
<b>SECTION 3 - EASY REFERENCE GUIDE FOR INSTALLERS .....</b>	<b>13</b>
<b>GLOSSARY.....</b>	<b>17</b>
<b>IMPORTANT SAFETY INFORMATION.....</b>	<b>20</b>



## **Section 1 - Introduction**

Integrated Services Digital Network (ISDN) is a digital communications technology with a great potential for the transport of all kinds of information. ISDN, as described in both domestic and international standards, is gaining widespread acceptance not only in commercial and industrial environments, but also in residential environments. Many residential users are looking to ISDN to provide faster data communications for access to the Internet. Other applications include telecommuting and home offices. Therefore, many prospective home buyers will prefer new homes that are wired with the correct cables and connectors to support advanced telecommunications like ISDN. We expect that the installation of cabling that supports advanced communications may become a key selling feature in the new residential home market.

The guidelines in this document are also applicable to new small business construction. The small business configurations addressed by this document are buildings that house several small office suites. Guidelines for other types of configurations, such as apartment buildings, campuses, and strip malls are contained in the document “ISDN Wiring and Powering Guidelines for Commercial and Multi-Tenant Residential Applications.” In general, if the structure of the building under consideration is large enough to require backbone cabling, then the reader should refer to the “ISDN Wiring and Powering Guidelines for Commercial and Multi-Tenant Residential Applications” document.

The purpose of this document is to provide guidelines for wiring new homes and small businesses to support ISDN. In addition to ISDN, the wiring practices in this document also support other advanced telecommunications such as Asymmetric Digital Subscriber Line (ADSL) and High data rate Digital Subscriber Line (HDSL).

It should be noted that the cable and configurations recommended in this document will also support analog service, also known as Plain Old Telephone Service (POTS).

This document is intended for building/telecommunications designers, telecommunications cable installers, and ISDN installers. Section 2 of this document provides background on ISDN, and the wiring configurations, types of cable, and connectors that are used to support ISDN. Section 2 also provides detailed guidelines for wiring a new residence to support ISDN. Section 2 may be useful for ISDN installers or building/telecommunications designers.

Section 3 is a quick reference guide for telecommunications cable installers, summarizing the steps necessary to ensure that the residence is wired with cable and connectors in the proper configuration to support ISDN.

A Glossary is located at the end of this document. It provides explanations or definitions of the terms used in this document.



## Section 2    An Introduction to ISDN Service and Wiring

This section provides some background information about ISDN service, and the wiring configurations, types of cable, and connectors that are used in support of ISDN. This section also provides detailed guidelines for wiring new homes and small businesses using the recommended configurations, cable, and connectors. If you are installing ISDN equipment, additional guidelines for the configuration and options for ISDN equipment can be found in NIUF 422R2-94, *ISDN Wiring and Powering Guidelines (Residence and Small Business)*.

Wiring considerations for ISDN are different from those for Plain Old Telephone Service (POTS). There are various cable types and wiring configurations that can support POTS. However, there are some new factors to consider with ISDN. The ISDN electrical signals that must be transported are different from those for POTS. **The wiring used for POTS may not be suitable for ISDN.** The characteristics of the cable, the manner in which it is installed, and the placement of components along the cable can affect the quality of the service.

Section 2.1 contains background information on ISDN service and components. **It is not necessary to read Section 2.1 for the purposes of installation.** The following topics are included in Section 2.1:

ISDN Connectors

ISDN Outlets

ISDN Cable

Demarcation point (Network interface)

ISDN U interface

ISDN S/T interface

ISDN Terminal Equipment

Section 2.2 provides detailed guidelines for installing ISDN in a new residence.

### 2.1    ISDN Components

#### 2.1.1    Connectors

Modular connectors (i.e., modular plugs and modular jacks) have been used in recent years by the telephone industry. There are two that are of particular interest — the

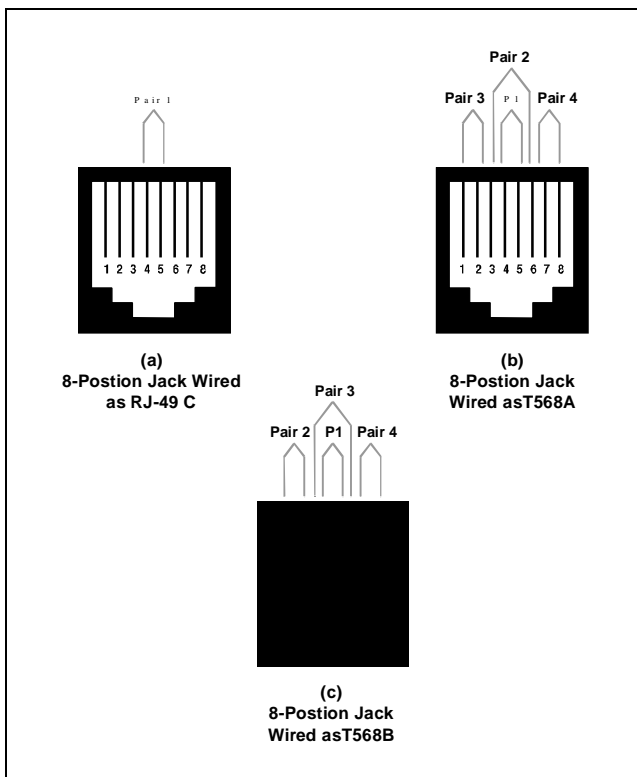
modular 6-position jack/plug and the modular 8-position jack/plug. The modular 6-position jack/plug is often referred to as an RJ-11 jack/plug, and the modular 8-position jack/plug is often referred to as an **RJ-45** (or RJ-49C) jack/plug. While the RJ-11 and RJ-45 designations are commonly used, there are situations when they might cause some confusion so we will use the more generic 6-position and 8-position terminology here.

The connector normally used for ISDN service/equipment is the modular 8-position jack/plug mentioned above. Although not typically used for POTS in a residence, modular 8-position connectors are often used for data services. Unlike the modular 6-position plug/jack where some of the pins are often not present, the 8-position plug/jack typically has all eight positions equipped with pins.

A modular 8-position plug/jack with only the center two pins wired is referred to as an RJ49C (see Figure 1-a). Note that this type of connector may also be designated SJA-11. Similarly a modular 8-position plug/jack with all eight pins wired is referred to as a T568A connector if the wiring is as shown in Figure 1-b. However, a modular 8-position

plug/jack might also be a T568B connector; similar to a T568A except with pairs 2 and 3 swapped (see Figure 1-c). The applicable color coding for wiring an ISDN connector using the recommended 4 pair twisted wire is as shown in Table 1. T568A is typically used for BRI ISDN installations, however, either T568A or T568B may be used in the installation. It is important that either T568A or T568B be used consistently throughout the installation, they should not be combined within the same installation. Section 2.2.1 provides additional details on installation guidelines.

It is worth noting that, despite the difference in width, a modular 6-position plug can be inserted into a modular 8-position jack. The construction of the 6- and 8-position connectors is such that the pins in the 6-position plug will align with the pins in the six center positions of the 8-position jack. For example, if the center four pins are present in a 6-position plug they will align properly with the center four pins in an 8-position jack. While the use of a 6-position plug in an 8-



**Figure 1: Some typical connector wiring configurations**

Note: Above jacks shown larger than actual size.

with the center four pins in an 8-position jack. While the use of a 6-position plug in an 8-



position jack is not recommended or encouraged, it can be used without fear of mismatching between the plug and jack pins.

### 2.1.2 Outlets

The recommended jack/wall outlet for ISDN service is the modular 8-position jack referenced earlier. **It may be possible to use 6-position jacks/wall outlets but there is a high likelihood of encountering compatibility problems (e.g., ISDN components will likely have 8-position plugs).** Most ISDN terminal equipment and other high speed data applications require an 8 position Modular Jack, however, POTS generally uses a 6 position jack. POTS may also utilize an 8 position jack. Therefore we recommend that at least one outlet in the home or business be wired with an 8 position jack.

Note that the terms 6-Position Modular Jack and 6-Position Modular Plug do not always imply that all 6 metallic conductors are present. The variations as shown in Figure 2 use the same modular jack (plug) housings but all conductors (pins) are not always present. The 6x4 jack, shown in the center of Figure 2, is the variation that you are most likely to find in your house. The notation 6x4 indicates that the jack is 6 positions wide with only the 4 center positions installed. The line cord connecting the phone to the Jack will most likely have a 6x4 or 6x2 plug.

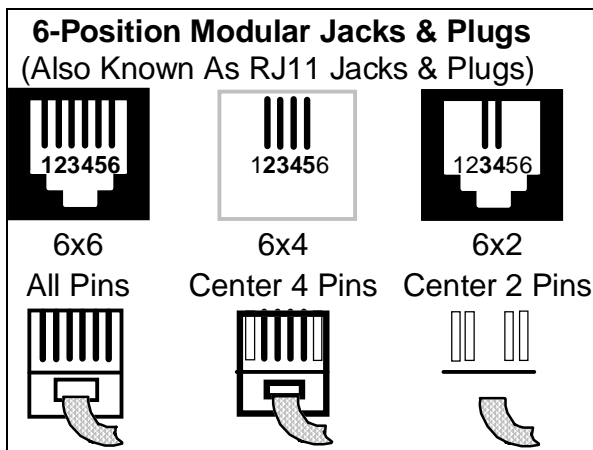


Figure 2: Six Position Jacks and Plugs

Conductors	EIA/TIA Standards		
	<b>Twisted pair</b> color coding	8-pos. pin #	
		T568A	T568B
Pair 1	White-Blue*	5	5
	Blue **	4	4
Pair 2	White-Orange*	3	1
	Orange **	6	2
Pair 3	White-Green*	1	3
	Green **	2	6
Pair 4	White-Brown*	7	7
	Brown **	8	8

Conductors	<b>Twisted pair</b> color coding	6-pos. pin #
		T568B
Pair 1	White-Blue*	4
	Blue **	3
Pair 2	White-Orange*	2
	Orange **	5
Pair 3	White-Green*	1
	Green **	6

**Table 1:** Premises Wiring Color Code

\* The wire insulation is white with a colored marking (typically a stripe) added for identification.

\*\* A white marking (typically a stripe) is optional.

### **2.1.3 Cable**

When new cabling is to be installed, it is strongly recommended that the standards set forth by the Electronic Industries Association/Telecommunications Industry Association (EIA/TIA) be followed. The EIA/TIA-570, *Residential and Light Commercial Telecommunications Wiring Standard*, recommended minimum wiring is 8-conductor (4-pairs) *unshielded* twisted pair (UTP), category 3 or higher, 24 gauge. Category 4 or 5 cable is satisfactory for ISDN service although it exceeds the requirements necessary for ISDN and is somewhat more expensive than category 3 cable.

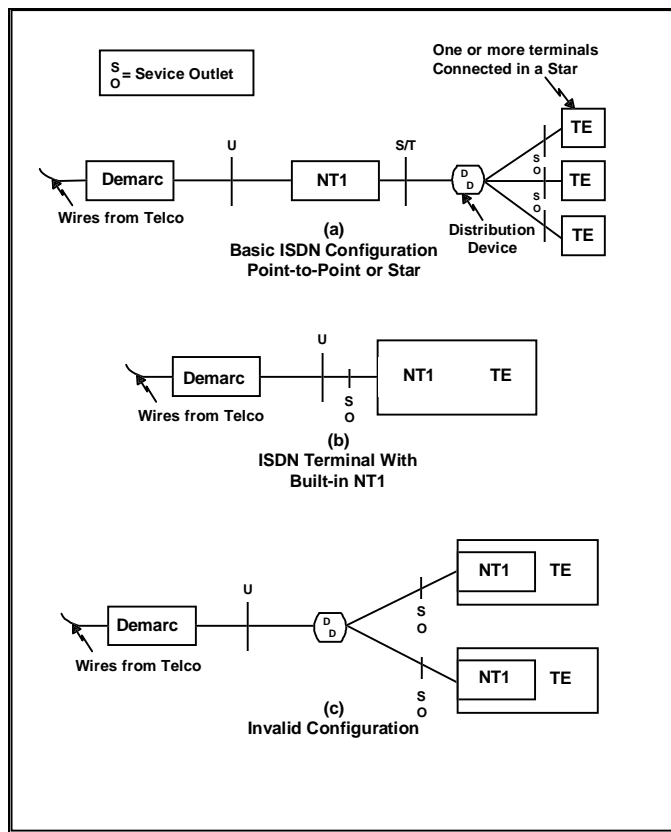
### **2.1.4 The Demarcation Point**

ISDN is “delivered” to a home or business in a manner that appears identical to existing POTS. The point at which the wire from the telephone company is connected to the wire that runs through the home or business is usually called the demarcation point or “demarc”. This point is also sometimes known as the network interface (NI) since it is where the responsibility of the network service provider (i.e., typically the telephone company) meets or “interfaces” with the responsibility of the home or building owner. In other words, the ISDN demarc is the same as the POTS demarc. In this document the term demarcation (demarc) point will be used instead of the term network interface.

### **2.1.5 The ISDN U interface, S/T interface, and ISDN Terminal Equipment**

With normal telephone service (POTS), the same electrical signals that arrive at the demarc from the telephone company central office continue on to the telephone set over two wires. However, with ISDN, an additional component is required between the demarc and the ISDN terminal equipment. That additional component is called a Network Termination 1 (NT1). One side of the NT1 connects to the U-interface, as shown in Figure 3.

The U interface is simply any point along the pair of wires from the telephone company after they have passed through the demarc point and before they get to the NT1. Thus, the term U interface does not refer to a specific connection point like the demarc, but rather represents certain electrical characteristics, defined by the ISDN technical standards, that occur on a 2-wire transmission path. The NT1 converts the signal arriving on the 2-wire U interface to a 4-wire electrical signal carried by the S/T interface. The NT1 may be almost adjacent to, or a considerable distance from, the demarc. The NT1 may be a standalone piece of equipment (Figure 3-a) or it may be built into an item of terminal equipment such as an ISDN telephone (Figure 3-b). There can be only one NT1 connected to a U interface. Thus, if multiple terminals are to be served by one ISDN line, they must be served by a single NT1 as shown in Figure 3-a.



**Figure 3: Examples of ISDN equipment configurations**

The wiring that runs between the NT1 and the terminal equipment is called the S/T interface as shown in Figure 3. Just as with the U interface, the term S/T interface does not refer to a specific connection point but rather represents specific electrical characteristics. Also, recall that in some applications the NT1 may be included in the terminal equipment (TE) so there is no exposed S/T interface. Unlike with the U interface, multiple terminal equipment devices can be connected to the S/T interface.

As mentioned earlier, the ISDN electrical signal that passes from the NT1 to the TE requires two pairs of wires (i.e., the S/T interface uses 4-wire transmission). However, the S/T interface is defined as an 8-wire interface - 4 wires for signal transmission and 4 wires for optional power arrangements. Depending upon the powering arrangements used, the S/T interface for a given installation may require only 4 or 6 of the 8 wires that are specified.

## 2.2 Guidelines for Installing ISDN in a New Residence or New Small Business

The wiring method recommended in this section is based on EIA/TIA-570, *Residential and Light Commercial Telecommunications Wiring Standard*. Adhering to EIA/TIA standards will help ensure added value and less likelihood of troubleshooting cable faults. Once the new wiring is in place, with the correct distribution device installed either by the installer or by the homeowner, the homeowner can choose the target rooms which will have ISDN service. If changes are required later, then the versatility exists for the homeowner to move the ISDN Terminal Equipment from one location to another with ease.

### 2.2.1 Requirements

This wiring configuration requires the following components:

- Four pair (8 wire) UTP cable, Category 3 cable or better.

- A distribution device that provides at least 4 pair cable input and several outputs per input cable. The number of outputs will depend on the number of rooms to be cabled for ISDN. The distribution device will be needed to connect the “legs” from the star configuration to the demarc. If the distribution device is not provided by the builder, then the homeowner will need to have one installed. It is important that pair integrity be retained between the distribution device and the service outlets.
- 6 position or 8 position Modular Jacks that conform to T568A or T568B standards, and are rated Category 3 or better. It is important that either T568A or T568B be used consistently throughout the installation, they should not be combined within the same installation. The standard recommends matching the cable and jack categories, however a category 3 jack used with a higher category cable will provide improved performance for ISDN over a category 3 cable and allows for easier system upgrade. Most ISDN terminal equipment and other high speed data applications require an 8 position Modular Jack, however, POTS generally uses a 6 position jack. POTS may also utilize an 8 position jack. Therefore we recommend that at least one outlet in the home or business be wired with an 8 position jack.

**NOTE:**

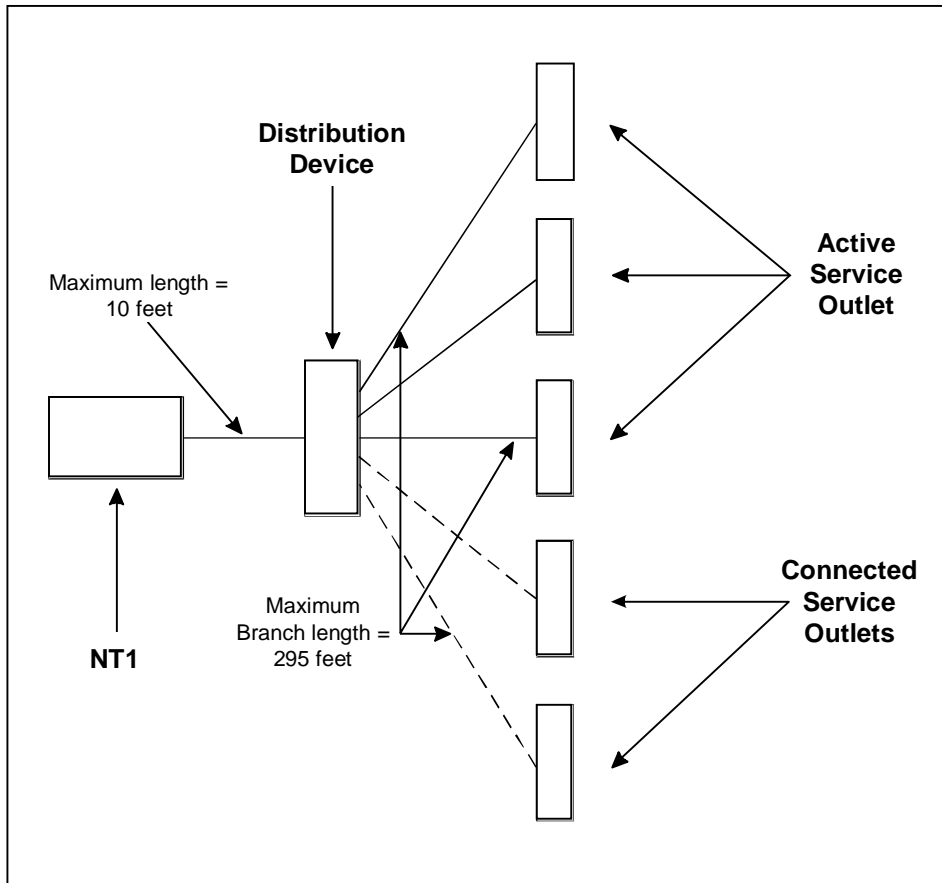
**Polarity integrity must be maintained on the S/T Interface wiring. The terminal equipment will not operate if there is incorrect polarity or pair reversal.**

### **2.2.2 Star Configuration**

When multiple service outlets are "home run" to a centralized distribution point, the configuration is referred to as "star wiring". Another term for this is an ISDN Passive Bus (also referred to as Branched Multipoint) using a star configuration. The Star Configuration allows the NT1 and/or distribution device to be placed in a central location with the termination of individual cable runs. Unlike POTS wiring, ISDN wiring is subject to certain considerations and limitations as defined in standards. Therefore, the following guidelines should be used:

- The maximum branch length of any cable run should not exceed 295 feet.
- No extraneous connections should be made to any leg of the star (e.g., bridged taps).

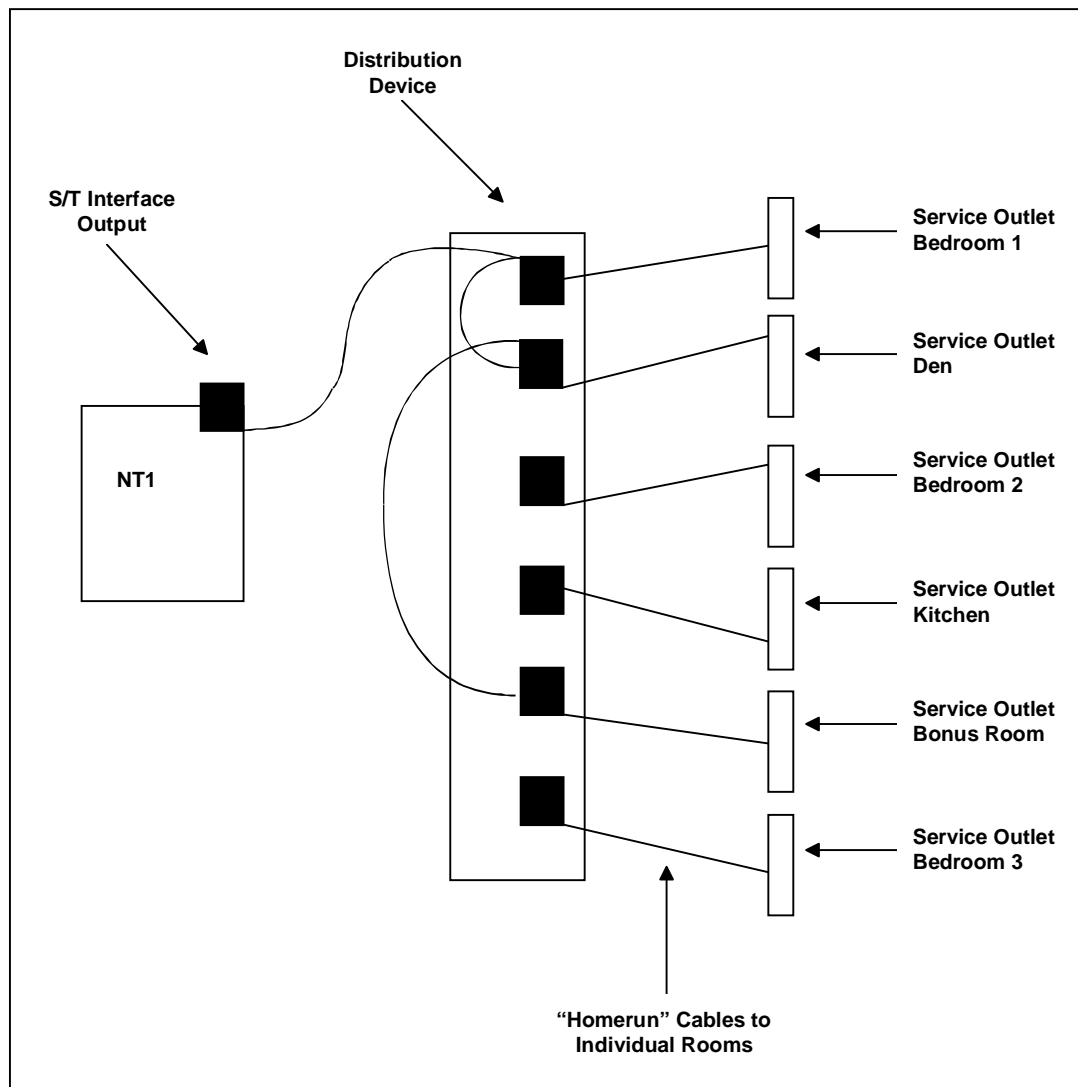
- Previous POTS installations may have used a configuration where the same pair is wired to several outlets in a chain. This may be referred to as a “daisy chain” configuration. Daisy chain wiring is not recommended for ISDN.



**Figure 4: Star Configuration**

### 2.2.3 Task - Location of the Distribution Device

The distribution device should be centrally located, usually close to the demarc, in order to minimize the length of the cable between the distribution device and the service outlets. Additional details concerning distribution devices is given in NIUF 433R2-94, *ISDN Wiring and Powering Guidelines (Residence and Small Business)*.



**Figure 5: S/T Star Configuration Using a Distribution Device**

Figure 5 illustrates an NT1 and a distribution device centrally located, with all cable runs being routed to the same location. With the use of this distribution method, ISDN service can be moved from one room to another. Currently, the figure shows ISDN service connected to bedroom one, den and bonus rooms. Consideration should be given to providing an un-switched AC power outlet near the distribution device if power is needed for the NT1 at this location. To assist the homeowner, or ISDN installer, the distribution device, if provided, should be labeled.

#### **2.2.4 Task - Wire the Service Outlets**

Install 4 pair cable from the Distribution Device to each Service Outlet. Terminate all 4 pairs on a modular jack that conforms to T568A or T568B standards (8 pins with 8 conductors). Be sure to use the same standard on all jacks. The jacks should have at least the same Category rating as the cable being used.



### **Section 3 - Easy Reference Guide for Installers**

The following page may be removed from this document for easy reference when installing cable for ISDN.



## Wiring ISDN Service to Multiple Target Rooms

### REQUIREMENTS

The STAR wiring configuration, as shown in Figure 1, requires the following components:

- Four pair (8 wire) UTP cable, Category 3 cable or better.

A distribution device that provides at least 4 pair cable input and several outputs per input cable. The number of outputs will depend on the number of rooms to be cabled for ISDN. The distribution device will be needed to connect the “legs” from the star configuration to the demarc. If the distribution device is not provided by the builder, then the homeowner will need to have one installed. It is important that pair integrity be retained between the distribution device and the service outlets.

6 position or 8 position Modular Jacks that conform to T568A or T568B standards, and are rated Category 3 or better. It is important that either T568A or T568B be used consistently throughout the installation, they should not be combined within the same installation. The standard recommends matching the cable and jack categories, however a category 3 jack used with a higher category cable will provide improved performance for ISDN over a category 3 cable and allows for easier system upgrade. Most ISDN terminal equipment and other high speed data applications require an 8 position Modular Jack, however, POTS generally uses a 6 position jack. POTS may

also utilize an 8 position jack. Therefore we recommend that at least one outlet in the home be wired with an 8 position jack.

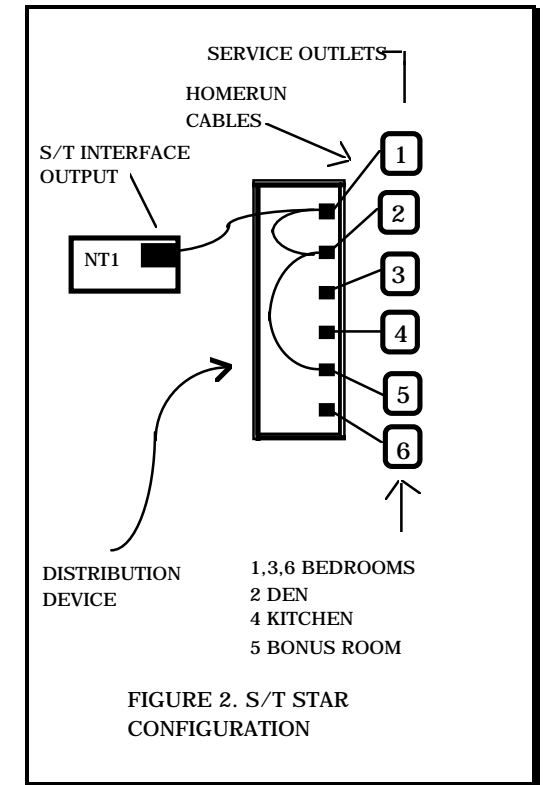
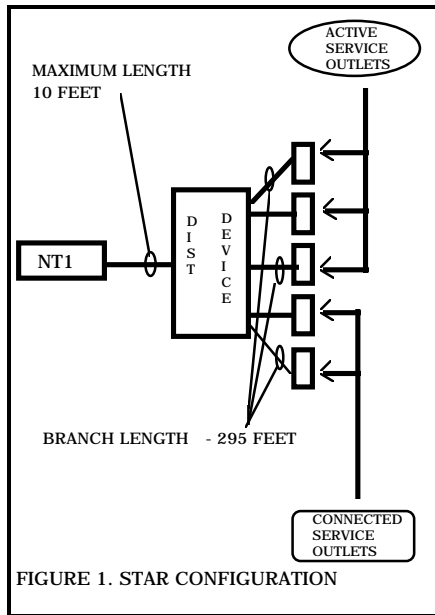
**NOTE: Terminal equipment won't operate if**

### Introduction

This task-oriented pamphlet describes a simple method of wiring ISDN to multiple rooms. The method described here is based on the EIA/TIA 570 standard to ensure value and reduce cabling faults.

Other wiring methods are described in detail in NIUF document NIUF 433R2-94 "ISDN Wiring and Powering Guidelines (Residence and Small Business)." Refer to this publication for clarification of concepts described in this pamphlet.

New wiring in the home will support services like POTS, ISDN and other future needs. Once the new wiring is in place, and the distribution device is installed, the customer may choose the room(s) for ISDN service. This also allows the versatility of moving the terminal equipment from room to room.



**S/T interface wiring is reversed.**

The configuration shown in Figure 2 permits movement of ISDN service from one room to another. The illustration shows ISDN service connected to: bedroom 1, den and bonus room.

## STAR WIRING CONFIGURATION

When multiple outlets are "homerun" to a central distribution point, it is called PASSIVE BUS, BRANCHED MULTIPOINT, or STAR wiring.

## PLACEMENT OF THE DISTRIBUTION DEVICE

Centralized location of the distribution device minimizes the length of the service outlets. Consideration should be given to providing an unswitched AC power outlet near the distribution device if power is needed for the NT1 at this location. To assist the homeowner, or ISDN installer, the distribution device, if provided, should be labeled.

## STAR CONFIGURATION

STAR wiring allows the NT1 to be centrally located where individual cable runs are terminated.

- The maximum branch length of any cable run should not exceed 295 feet.
- No extraneous connections should be made to any leg of the star (e.g., bridged taps).
- Previous POTS installations may have used a configuration where the same pair is wired to several outlets in a chain. This may be referred to as a "daisy chain" configuration. Daisy chain wiring is not recommended for ISDN.

## WIRING THE SERVICE OUTLETS

Install 4-pair cable from the distribution device to each service outlet. Terminate all 4-pair on a modular jack conforming to T568A or T568B standards (8 pins/8 conductors). Using this standard, all jacks and wiring should be category 3 or better.

## IMPORTANT SAFETY INFORMATION

**\*DO NOT WORK ON THE TELEPHONE WIRING AT ALL IF YOU WEAR A PACEMAKER.** Telephone lines carry electrical current.

\*Never install telephone wiring during a lightning storm.

\*Never install telephone jacks in wet locations unless the jack is specifically designed for this purpose.

\*Use a screwdriver and other tools with insulated handles.

\*You and those around you should wear safety glasses or goggles.

\*Be sure that the in-house wiring is not connected to the Demarc while you are working on your telephone wiring.

\*Do not place telephone wiring or connections in any conduit, outlet or junction box containing electrical wiring.

\*Installation of In-house wire may bring you close to electrical wire, conduit, terminals and other electrical facilities. ***EXTREME CAUTION must be used to avoid electrical shock from such facilities.***

\*Telephone wire must be at least 6 feet from bare (un-insulated) power wiring or lightning rods and associated wires, and at least 6 inches from other wire (antenna wires, doorbell wires, wires from transformers to neon signs), steam or hot water pipes, and heating ducts.

\*Do not place a jack where it would allow a person to use the telephone while in a bathtub, shower, swimming pool, or similar hazardous location.

\*Protectors and grounding wire placed by the service provider must not be connected to, removed, or modified by anyone other than the service provider.

\*Use care not to deform the wire by crimping, making knots, sharp corners, etc.

\*Check local building codes for safety guidelines.

## Glossary

TERM	DESCRIPTION
ADSL	Asymmetric Digital Subscriber Line. A transmission technology that facilitates the simultaneous use of normal telephone services, data transmission of 6 Mbps in the downstream, and Basic Rate Interface ISDN.
analog phone	A POTS phone or one that does not use digital representations of the voice or data information being communicated on it. Residential phones are almost always analog.
Basic Rate Interface (BRI)	Interface by which ISDN terminals access the local switch that provides full-duplex ISDN basic rate access. The BRI is composed of two 64-kbps clear B channels for information (voice or data) transfer in either circuit or packet mode and one 16-kbps clear D channel for packet data information transfer and signaling communication with the Telco Switch.
bridged tap	An unused segment or leg of a cable pair - often the result of equipment rearrangements.
cable	A number of insulated conductors within a protective sheath. Cables are generally fixed in place. Compare to "cords".
category 3 cable	See discussion under unshielded twisted pair (UTP) cable.
category 4 cable	See discussion under unshielded twisted pair (UTP) cable.
category 5 cable	See discussion under unshielded twisted pair (UTP) cable.
cords	The term generally applied to the flexible multi-conductor cables used for connecting terminal equipment to a service outlet or a handset to the base unit. Also see line cord and extension cord.
daisy chain wiring configuration	A configuration of customer premises wiring where a series connection of the jacks is used, i.e., wiring from jack 1 is extended to jack 2, then perhaps to jack 3 and so on.
demarc	Abbreviation for "demarcation point". The point where telco owned wiring meets customer owned wiring. The actual connection device may be anything from simple binding posts to special boxes which include lightning & power surge protection devices.
distribution device	A connection device which typically has one plug directly connected to more than one jack or one terminal pair onto which more than one wire pair can be connected. A common type would be one modular plug to 2 or 3 modular jacks.
EIA/TIA wiring standards	Standards developed by the Electronic Industries Association to define various types of cables. One of their requirements is for the use of unshielded twisted pair cabling in homes and small businesses.
HDSL	High bit-rate Digital Subscriber Line - Repeaterless Full-Duplex Digital (E1 or T1) Transmission Using Two Pairs of Unconditioned, Non-loaded Copper. Provides extended distance of up to 4.5 miles on 19 gauge.

<b>TERM</b>	<b>DESCRIPTION</b>
Integrated Services Digital Network (ISDN)	International standard for a public communication network to handle circuit-switched digital voice, circuit-switched data, and packet-switched data.
interface	Point at which independent systems or devices communicate with each other.
ISDN phone	A telephone set which is able to communicate according to the ISDN protocol, for both voice and data.
jack	A socket or receptacle into which a plug is inserted for purposes of making an electrical connection. Also see outlets and plugs
modem	MOdulator-DEModulator. Device that allows digital signals to be transmitted over analog facilities.
modular jack	The popular, modern, small jack which is found in most homes/businesses and into which is plugged your phone, using a line cord terminated by a modular plug. It adheres to industry standards for size, shape, etc.
modular plug	The popular, modern, small plug which is found on most cords and adheres to the industry standards for "modular" connectors.
multipoint	See Passive Bus.
network interface	Referred to as "demarc" in this document. See demarc.
Network Termination 1 (NT1)	The NT1 is a physical device that converts the 2-wire U interface into the 4-wire S/T interface. It may be a standalone item or it may be built into a piece of terminal equipment.
outlet (phone)	See service outlet
plug	The connecting device on the end of a cord which electrically mates with a jack
POTS	Plain Old Telephone Service, i.e.. the typical residential phone service, with few "features". May also be used to describe the type of connection (loop) to a central office which is designed for the POTS type of phone.
ring wiring configuration	The same as daisy chain wiring, except the last jack is connected to jack 1, thus completing a ring.
RJ11 jack/plug	A 6 position modular jack/plug.
RJ45 jack/plug	An 8 position modular jack/plug.
RJ49C jack/plug	An 8 position modular jack/plug.
S/T interface	The electrical characteristics for a four wire physical interface, defined by ISDN standards, that exist on the output or terminal equipment side of an NT1.
star wiring configuration	A wiring configuration in which each jack or endpoint is directly connected to a central distribution point
T568A	Designation of an eight-position modular jack that specifies a standardized set of pin/pair assignments. In particular, pair 1 is designated as pins 4 and 5, pair 2 is designated as pins 3 and 6, pair 3 is designated as pins 1 and 2, and pair 4 is designated as pins 7 and 8.

<b>TERM</b>	<b>DESCRIPTION</b>
T568B	Provides an alternate designation of an eight-position modular jack to the T568A. In particular, pair 1 is designated as pins 4 and 5, pair 2 is designated as pins 1 and 2, pair 3 is designated as pins 3 and 6, and pair 4 is designated as pins 7 and 8.
terminal equipment	A telecommunications or input/output device which is at the end of the communications circuit. Includes such equipment as telephones, personal computers and answering machines.
twisted pair cable	A cabling configuration wherein each pair of wires within the sheath is twisted together. The twisting provides a significantly greater level of crosstalk rejection compared to cabling where the pairs are not twisted together. Twisted pair cable without metallic shielding around any of the pairs is called Unshielded Twisted Pair (UTP) cable. One or more pairs, wrapped with metallic foil or braid, designed to shield the pair(s) from electrical interference, is called Shielded Twisted Pair (STP) cable. ISDN cannot use shielded wire.
U interface	The electrical characteristics, defined by ISDN standards, that exist on a 2-wire transmission path portion of an ISDN line (i.e., on the input or line side of the NT1).
UTP (unshielded twisted pair) cable, category 3, 4 and 5	EIA/TIA-568 defines three "levels" of 24 gauge UTP cable and associated connecting hardware - category 3, 4 and 5. Category 3 is the minimum considered suitable for ISDN. Categories 4 and 5 are also suitable but are likely to be more expensive than category 3 due to higher performance characteristics. The main difference between categories 3,4 and 5 is that they handle signal frequencies up to 16, 20 and 100 MHz, respectively. The desired wiring for ISDN is 24 gauge, 4-pair, category 3 (minimum) UTP.

## **Important Safety Information**

**DO NOT WORK ON THE TELEPHONE WIRING AT ALL IF YOU WEAR A PACEMAKER.** Telephone lines carry electrical current.

Never install telephone wiring during a lightning storm.

Never install telephone jacks in wet locations unless the jack is specifically designated for wet locations.

Use a screwdriver and other tools with insulated handles.

You and those around you should wear safety glasses or goggles.

Be sure the inside wire is not connected to the access line while you are working on your telephone wiring.

Do not place telephone wiring or connections in any conduit, outlet or junction box containing electrical wiring.

Installation of inside wire may bring you close to electrical wire, conduit, terminals and other electrical facilities. **EXTREME CAUTION** must be used to avoid electrical shock from such facilities.

Telephone wire must be at least six feet from bare (un-insulated) power wiring or lightening rods and associated wires, and at least six inches from other wire (antenna wires, doorbell wires, wires from transformers to neon signs), steam or hot water pipes, and heating ducts.

Do not place a jack where it would allow a person to use the telephone while in the bathtub, shower, swimming pool, or similar hazardous location.

Protectors and ground wire placed by the service provider must not be connected to, removed, or modified by anyone other than the service provider.